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THE AGRICULTURAL STUDENT



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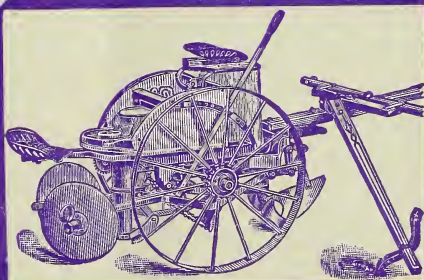
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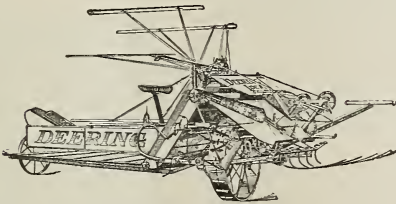
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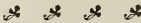
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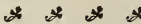


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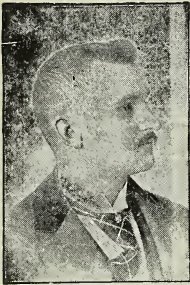
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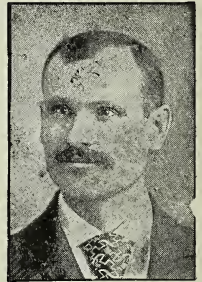
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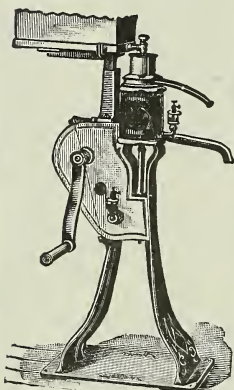
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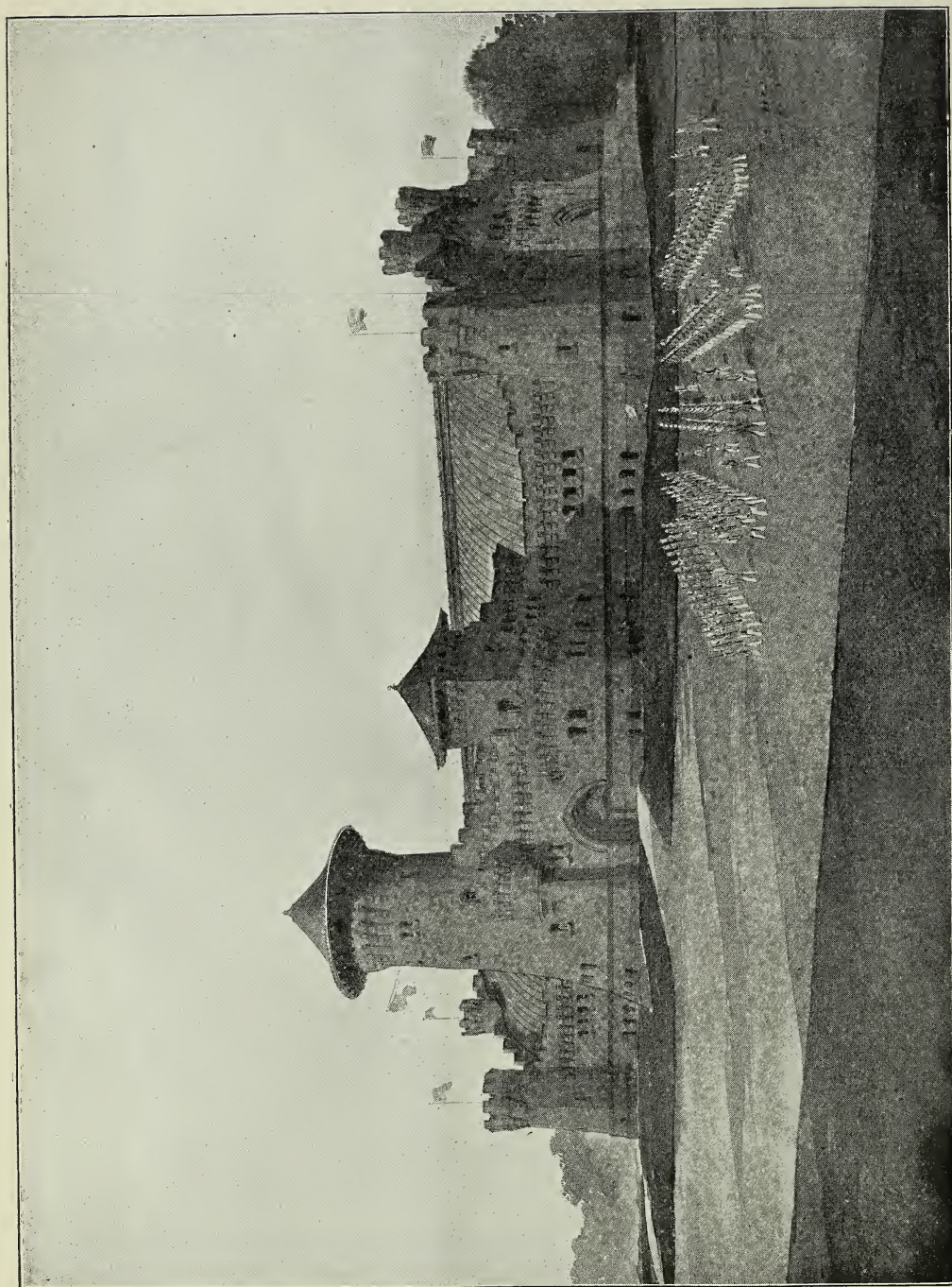
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EDITORIAL CHAT.

A forestry bill has been prepared by a committee from the Columbus Horticultural society and presented in the house by Representative Gayman, of Canal Winchester, Franklin county. This bill is intended to better the forest conditions of Ohio, it having been found that such removal of forests as has already taken place has had its bad effects.

To prevent further forest destruction this bill provides that the land owner shall be released from taxation upon uncleared lands upon which are standing at least fifty growing trees per acre. To encourage further forest planting the bill provides that the land owner shall be released from taxation upon two acres of land for every acre set with trees according to the rules to be provided if the bill is passed. In order to obtain a knowledge of forest management the bill provides for the establishment of a forest experiment station.

Not many know the importance of the forests in the "natural balance" of a country. That such a balance exists might be shown by some of the effects which we see when forests are removed. Among these results the most important at this time would probably be the effect upon the water supply. The floods in springtime and the droughts in mid-summer are caused by the removal of forests about the headwaters of the streams. At least, if the forests still stood, these extremes would not be reached so often.

This bill is a good one and should be supported by everyone who is interested in the future welfare of the state and people. Reasons for its support might be advanced as follows: 1. Regulate water supply. 2. Protect agriculture. 3. Insure future timber supply. 4. Prevent total destruction of forests in the state. 5. Easement from taxes upon standing timber which is bringing no cash income but is benefiting the community as well as the owner.

There is great discussion among the students of the university concerning a late action of the faculty by which future team work in athletics is forbidden until a definite plan for settling up the indebtedness of the athletic association is formulated. Whether or not the faculty has a right to take action in this matter is a question which many are considering. Since the athletic association is entirely a student affair, some ask what right has the faculty to interfere. But on the other hand, the association is under the name of the university, its members are all students, alumni or teachers in the university, and such action as the association takes will bear the approval of the university, to the outside world, at least. Suffice to say, that the debt which the association bears is an honest one and should be paid, and if proper means are resorted to, not only will the debt be paid, but a new life will breathe into our now dormant athletics.

Columbus Horticultural Society.

The society held a very interesting meeting in Botanical Hall, at the university, on Saturday, February 26, 1898, at 2:30 p. m. The following interesting program was rendered:

"Lawn Management and Grass Seed Mixtures" Mr. Sperry
 "An Experiment With Grass for Lawn and Hay" H. M. Sessions
 "Planting About the Home"
 Prof. W. A. Kellerman

Notes.

Mr. W. C. Werner, who will be remembered as a former assistant in the Department of Botany and Horticulture, and who is recognized as one of the ablest systematic botanists of the state, is now engaged in the business of florist in Painesville. He is an active member of the Lake County Horticultural society.

The bill to establish forestry stations and to promote the preservation and planting of forest trees in the state of Ohio, which was prepared by the Columbus Horticultural society, has been introduced by Representative Gayman, of Winchester, Franklin county. The main features of this bill are excellent, and it ought to pass without serious opposition.

The bill establishing a commission to stamp out and prevent as far as possible the further introduction and spread of the San Jose scale and other insect and fungus enemies in the state, is meeting with some opposition but will probably become a law

Mr. W. M. Perry, a senior student in the course in horticulture in the Virginia Agricultural and Mechanical College, was a visitor here at the State University a few days ago. He was much pleased with the evident prosperity of our college of agriculture, and was surprised by the broad field of instruction and training carried by the university.

Mr. H. H. Richardson, B., Agr., '92, is a successful practical horticulturist at Brooklyn, Cuyahoga county. Despite the general depression of the years just past he reports a fair degree of prosperity and has demonstrated that horticulture is a profitable vocation. Mr. Richardson is president of one of the Cuyahoga county horticultural societies.

Prof. Lazenby has recently received a very interesting letter from Takekuma Okada, who took a special course at the State University seven or eight years ago. He is interested in the agricultural college of the Imperial University of Japan, at Tokyo, and is collecting statistical information for that college.

Director True, of the office of experimental stations of the United States Department of Agriculture, in his official report, has words of praise for the work done at the Arizona Experiment Station by Director W. S. Devol, one of the early graduates of our agricultural college. Unfortunately, however, owing to political influences, Director Devol has been recently removed and Director True states at the close of his report that "the outlook of the station is therefore much more uncertain than at the close of the past fiscal year.

A similar report concerning the work done at the Oklahoma Experiment Station is also gratifying to the friends of the university, because on the working staff of this station are Prof. E. E. Bogue and Prof. J. H. Bone, both graduates of our college of agriculture. Prof. Bogue is the horticulturist, and Prof. Bone is the assistant agriculturist of the station.

It gives us pleasure to announce the marriage of Miss Underwood, of Columbus, and Mr. Philip Baer, of the class of '97, on the evening of March 3. The ceremony took place at the home of the bride's parents, 90 West Lane avenue,

Columbus, Ohio. The Agricultural Students extends its best wishes to the newly wedded couple.

Mr. Homer C. Price, '97, has applied for the fellowship in agriculture at Cornell University. Mr. Price is a student of marked ability and would undoubtedly do justice to his appointment.

Address of Col. J. H. Brigham.

The following is a resume of the address by Assistant Secretary of Agriculture Brigham, at the dedication of Townshend Hall:

Mr. President, Ladies and Gentlemen:

I appreciate the importance of being brief upon such occasions, and I shall try to limit my remarks so as not to trespass upon the time of those who are to follow.

I am very proud of the building today dedicated to the work of agriculture. It is a grand structure, but not too grand and good a monument to the noble man and friend of agriculture after whom it is named. There was a time when I feared that this institution would not do for agriculture what it seemed to me it was in duty bound to do. Others shared in this feeling, but we are very glad indeed today to rejoice with you in the splendid work which you are now conducting at this institution in the interest of agriculture and the mechanic arts.

The state of Ohio, in common with other states, is under obligations to be faithful to the trust which they accepted from the National Government. I regret to say that in some of the states they have not been true to this trust. I am very glad that this cannot be said of the state of Ohio. No one defends or excuses disloyalty to a trust; no one respects the man who is untrue to any trust reposed in him. So far as the Department is concerned, I can assure you that it is the purpose of those who are responsible for its work to do everything in their power to aid education along the lines that will inure to the benefit of the most important industry of our country. Many people, some of them farmers, do not seem to appreciate the importance of agriculture. From a financial point of view, it is the most important of all our

industries. As wealth-producers the farmers outrank all other classes in the country, and yet few people when discussing wealth think of agriculture or the farmers. It would take nearly all the gold and silver mined in the United States since 1834 to equal in value the farm products of last year. There is not enough gold and silver mined in the world in a year to buy the wheat crop of the United States in 1897. It will thus be seen that as wealth-producers the farmers hold a very important place. It is the one indispensable calling of man. We could survive the loss of some of our professions and other great business interests, but if the farmers should refuse to till the soil, every industry and great interest of our country would be ruined and starvation would come to all our people. No one need be ashamed to be classed with such an important class of our citizens. Every man interested in the welfare of his country should be glad to promote in every way possible this interest. The farmer must not only be taught how to farm successfully, but he must be taught to meet those responsibilities bravely and wisely that devolve upon him as a citizen of the greatest and grandest nation in all the world.

The work of this institution can be extended indefinitely along these lines, and I can assure you that the Department of Agriculture will gladly co-operate with you in every way possible. The Department may be considered a co-worker with you in the effort to educate, uplift and help those who feed and clothe the world. I am glad to have been permitted to meet with you on this occasion and say a few words of encouragement. Others will speak of the grand character of the man who passed some of the best years of his life in working at this institution and helping to build up the institution. I thank you for the attention given and will not detain you.

Symbiosis or Blended Growth.

By C. W. WAID.

The fact that animals and plants of different species are often found associated together for mutual benefit is not a new one.

Naturalists have long known that parasite plants send their roots so deeply into their host plant that they are enabled to secure the necessary moisture and food for their growth, and it is to be presumed that there is a certain amount of nourishment taken up by the leaves of the parasite and given off to its host.

During the last few years the subject of compounded growth has attracted no little attention. The term symbiosis has been applied to all phenomena which depend upon the blended growth of unlike plants. It has been observed that certain fungi attach themselves to many kinds of forest trees in such a manner that the fungus conveys food to the tree. Fungi have been found growing in this way on oaks, beech, hornbeam, birch, alder and on evergreens such as fir, pine, spruce and larch. It has been observed that the roots of trees which have this fungus growth are destitute of the fine hairs which are present on most plants. In the place of the plant hairs a thick coating of mycelium covers the surface of the roots.

The humus of woodland is often very poor in nitrates, and in such conditions we find trees which are able to secure their food through the root-fungi the most common.

This growth has been observed to confine itself nearly always to land which is poor in nitrates and when the trees are transplanted to lands good in nitrates the fungus soon disappears.

Botanists have often speculated as to the function of certain knobs, warts nodules or tubercles found common on clover roots, lupines and other leguminous plants.

Berkley, in 1863, discovered these bodies and said he believed them to be important organs in case of drought, and very possibly that they serve some especial object besides.

At first the idea was common that the tubercles were due to a diseased condition of the plant, but observations have shown that the plants upon which these were found were often the largest and most thrifty.

Some persons have thought that they acted as storehouses of food, while others

believed them to be normal organs peculiar to leguminous plants.

This last named view may be regarded as not far from correct; for the knobs may well be regarded as special organs, begotten by a parasite, but developed by the mutual action of the parasite and plant.

It has been determined that certain kinds of bacteria enter the roots of leguminous plants from the soil and form colonies within the roots, and that the knobs are formed by the simultaneous development of these bacteria and of the vegetable cells in the roots—that is to say by the reaction of the bacteria and the cells one upon the other. It has been made plain that both derive benefit from the reaction, for while the bacteria feed upon the plant and derive most of their food from it, they also take nitrogen from the air, and a part of the nitrogen thus collected is consumed and put to profit by the plant, which in this way feeds upon or through its own parasite. The practical result of the symbiotic growth in this case is that the fungus on the clover roots take free nitrogen from the air and assimilates it in such a manner as to form food for the clover plants. Before this fact was discovered DeVries had noticed that the nodules contained considerable quantities of albumen. He also observed as others have done, that very few nodules are developed on plants grown where there is an abundance of nitrates or where the plants can get plenty of nitrogen directly from the soil. A chemical analysis by Troschke of the clover roots and nodules has given the following results:

	Roots. Per Cent.	Nodules. Per Cent.
Fat	1.31	5.33
Nitrogen	1.13	7.25
Cellulose	59.95	9.45
Phosphoric Acid	8.84	16.19
Potash	12.80	16.90

By this we see that the nodules or tubercles are not only rich in nitrogen, but also in plant food. The discovery of the use and purpose of these tubercles has become of great value as now leguminous

plants can be grown successfully in soil comparatively destitute of nitrogen.

We owe this important discovery to the German chemist, Hellriegel.

Hellriegel's experiments were carried on by planting numerous varieties of seeds in sand to which had been supplied the necessary ash ingredients for the support of the crop. No nitrogen, however, was allowed to gain access to the soil or plant roots. The seeds all germinated well and the young plants grew well until the nitrogen contained in the seeds was exhausted, then the plants did not continue their growth, but seemed literally to starve. To some of the pea plants was supplied water which had recently been in contact with garden loam, where peas and clover had often been grown; these plants were seen to take on a dark green color and grow from that time until ripening, meanwhile nodules grew freely upon the roots which had borne none before. The experiment showed that the water applied contained the necessary bacteria which immediately went to work with the stated results.

More recent investigators have discarded the loam water, and have inoculated the roots either with matter taken from root nodules or with the pure root bacterium itself.

It is evident that the root-bacteria take free nitrogen from the air, transform it into organic compounds, and that the pea plant puts this nitrogenous matter to use either immediately or after the bacteria have died, or after they have undergone certain changes which are not yet clearly understood. Whatever the method, it has been proven without a doubt that nitrogenous matters do pass from the nodules into the plant. Hellriegel believes that a different bacteria is needed for different plants and he has performed experiments to uphold this theory. The best kind of loam to be used in supplying bacteria for red clover seems to be unknown as yet. That some kind will be found better than others is indicated by the practical experience of farmers who see daily that red clover grows well on some land and poorly on other equally as fertile to all appearances.

As regards the fungus on the roots of trees, the first idea was that they must take nitrogen from the humus, but in view of more recent observation would it not be likely that they too secure their nitrogen from the air?

Nor is the benefit of this absorbing power confined exclusively to the plants upon which the bacteria are found; we all know that the idea of plowing under a clover crop has been prevalent for some time, but very few farmers know why this is accompanied with such good results; they believe there is a large amount of fertility in the clover crop. Scientific knowledge shows that the nitrogen taken from the air remains in the nodules on the roots of the clover, and that it is in a condition to be taken up by the crop which may follow, with marked results in a larger and more healthy growth. It seems to be an accepted fact that leguminous crops cannot be successfully grown for more than 2 or 3 years in succession on the same ground; the cause of this is not actually known but the supposition is that bacteria which are enemies to the bacteria on the clover roots get so numerous as to destroy them or prevent their working.

The three or four-year crop rotation has become much more popular and much better understood since the facts in reference to those bacteria have been more fully known and better appreciated.

Root Tubercles in Water Culture.

BY PROFESSOR H. A. WEBER.

(Reprinted From the Journal of the American Chemical Society).

Since the discovery by Hellriegel of the connection between root tubercles and the fixation of atmospheric nitrogen by leguminous plants, the literature on this interesting and important question is being constantly enriched by painstaking experiments on the part of scientific investigators all over the world. The subject has thus far been studied only in connection with sterilized soil or sand. It occurred to the writer that it might be possible to produce root tubercles in water culture and thus be able to observe the process better than when the roots

of the plants were buried in soil or sand. The work of conducting the experiments about to be described was entrusted to Mr. J. C. Britton, one of the writer's advanced students. The results more than met my expectations, and this preliminary notice is made public for the benefit of those who may feel inclined to employ the method in their investigations.

For the past four or five years the writer has employed in water culture experiments an apparatus designed by himself, which presents certain advantages over the methods heretofore described.

(As no cut of this apparatus is obtainable we shall not attempt an explanation of it.—Ed.)

The advantages of this arrangement are:

1. Two seedlings, or as the writer has frequently done, three seedlings can be grown in the same solution at the same time, so that, if an accident should happen to one of the seedlings, the experiment need not necessarily fail.

2. The solution is continually being aerated as it drops into the thistle tube and into the collecting bottle, as well as when it is transferred to the aspirator. By this means the roots of the seedlings are continually supplied with free oxygen, a condition necessary for healthy growth.

3. Plants can be grown to maturity without removing them to other jars filled with fresh solutions.

4. The solution in the culture jars always remains at the same level, i. e., on a level with the side tube of the flask.

Two solutions were prepared as follows:

1. Complete nutrient solution (Wolff's solution).

	Grams.
Bone Ash Dissolved in Nitric Acid . . .	20
Potassium Nitrate	11
Magnesium Sulphate	7
Potassium Chloride	3
Ferrous Sulphate, minute quality.	

The whole dissolved in distilled water, neutralized with sodium carbonate, and diluted to one liter.

2. Complete Nutrient Solution without nitrogen.

Grams.

Bone Ash Dissolved in Nine CC.

Sulphuric Acid	20
Potassium Sulphate	9.5
Magnesium Sulphate	7.0
Potassium Chloride	3.0
Ferrous sulphate, minute quantity.	

The whole dissolved in distilled water, neutralized with sodium carbonate, and diluted to one liter. For the growing of plants the apparatus was filled with a mixture of the respective solutions and distilled water in the proportion of five cc. of the solutions to one liter of water. Trials with fifteen cc., and even ten cc. of the solutions to one liter of water, failed on account of over-nutrition, the seedlings refusing to grow and finally dying.

The plants employed were dwarf peas. The seeds were made to germinate in sterilized sand, moistened with distilled water. When the seedlings were four or five inches in height, they were taken from the sand, the roots washed and the plants transferred to the culture jars.

Three sets of apparatus were provided. The first set contained the complete nutrient solution. The second set contained solution No. 2, as described above without nitrogen.

The third set contained the same solution, but in addition the seedlings before being placed into the jars, were inoculated with tubercle germs, by immersing the roots for a few minutes in a cold water infusion of a soil, in which peas had been grown.

As might be expected, the plants in set No. 1, containing the complete nutrient solution, were healthy and vigorous, and produced flowers and fruit.

The plants in set No. 2 grew rapidly for a time, but were weak and sickly in appearance. In about ten days the leaves began to turn yellow and to show the effect of nitrogen starvation. A few small blossoms finally appeared, but this caused the speedy death of the plants. The roots developed very rapidly, completely filling the jars. They were doubtless in search of nitrogenous food.

The plants in set No. 3 grew normally for about ten days, when they began to show the effect of nitrogen starvation in

a marked degree. No tubercles could be observed on the roots. About the thirteenth day the plants began to recuperate, the leaves assumed a normal green color, and from this time on the growth was vigorous and normal. On the fifteenth day the tubercles were first observed, but they had then attained considerable size.

The plants, like those of set No. 1, produced flowers and fruit. Investigations in this direction will be continued.

Planting About the Home.

By PROFESSOR W. A. KELLERMAN.

(Abstract of a Talk Before the Columbus Horticultural Society).

The first and essential thing is to have a good and well-kept lawn of blue grass and white clover. No planting can take the place of this, and if the lawn is perfect no other planting is demanded in case the front yard is very small. Where the owner possesses a large lawn his taste need not be criticised if flowers, shrubbery and trees are entirely discarded. But the majority prefer to have some ornamental plants or shrubbery where the city lot is of good size or the country yard is of generous dimensions.

Usually the walk from the front door is and ought to be straight, leading directly to the sidewalk or road. If the distance is sufficient, or the point of intersection with the road or street is so situated that a gracefully curved walk can be laid out, so much the better.

The lawn should not be cluttered up or dotted over with shrubs or other plants. These will especially arrest the attention and distract from the pleasing impression of the place as a whole. Rather let the plants flank the sides of the lawn, the latter remaining unmolested. Then a each side of the central walk. Or if you pleasing picture will be presented.

Above all avoid planting in a symmetrical and artificial manner. Do not put exactly the same number of plants on do this, do not make one the exact counterpart of the other side. Arrange the plants so as to appear natural. In no case plant shrubs or trees in straight rows. This is allowable only along

avenues or along sidewalks—never on lawns even at the borders.

When the house has an east or north front there will be no need or excuse for planting large trees, unless the front lawn is very large. On city lots it would be seldom allowable. But for a west or south front shade is demanded, and elms or other good trees should generally be used where space will permit.

The plants at the side of the house, when there is space for such, should in the majority of cases be mostly near the fence or border of the lot rather than against the house. If a walk passes beside the house, then the plants should be mostly between the walk and the lot line.

Vines on the porch or front of the house are not always preferred—the style of the architecture and the taste of the occupant may without further comment suggest what the practice should be. But neglect of the vines when used is wholly inexcusable. Unobtrusive supports should generally be provided, and the arrangement should be such that the vines could be laid down temporarily for winter protection, for painting the building, etc.

Where feasible a back lawn should be laid out, and equal care bestowed upon it as on the front lawn. But since more retired, it may harbor more plants and flowers, and wilder or gayer natural conditions might here obtain. Yet useful (fruit-bearing) vines may also be used, especially when the back yard is toward the south.

While there are many desirable annuals that should receive attention, perhaps the large majority of plants ought to be perennials, herbs, shrubs and trees. This is true for the front lawn at least. What to plant from the hosts of excellent native and exotic species, can be selected after some study of the several kinds and the advice of a practical naturalist or reliable nurseryman.

History of Agricultural Literary Societies at the Ohio State University.

By W. C. MILLS.

It was in 1883 that the literary spirit as pertains to agriculture first took form at the Ohio State University in the shape

of Kirtland Agricultural society. For a year or more prior to the organization of this society the subject had been agitated, but not until in October, 1883, was there a definite step taken toward organization. The following students, who were taking the work in the Agricultural Department, called a meeting in Prof. Lazenby's lecture room, which at that time was in the main building (University Hall): W. S. Devol, W. P. Bentley, C. A. Stafford, W. C. Mills and W. B. Alwood. At this meeting William Brotherton, now with The D. M. Ferry Co., of Detroit, Mich., was elected president; W. S. Devol, now professor in the Agricultural College of Arizona was elected vice president; W. J. Green, now of The Ohio Experimental Station, was elected secretary; W. B. Alwood, now professor in the University of Virginia, elected treasurer. After organization Dr. Townshend, W. C. Mills and C. A. Stafford were appointed as members of a committee to draft a constitution and by-laws and present the same to the society for consideration, and at the same time select a suitable name for the society. Dr. Townshend, as chairman of the committee, proposed the name of "The Kirtland Agricultural Society," named after his former friend and collaborer, Dr. Kirtland, which name was accepted by the society.

The meetings of the society were held every two weeks on Friday evening, with regular literary program. Dr. Townshend and Prof. Lazenby were active members and took great interest in the welfare of the society. The following year Mr. W. P. Bentley, now a missionary in China, was elected president. During the next few years Kirtland society was not so prosperous as it had been during the preceding years, as most of the promoters of the society had left college.

In 1887, the society was again revived and Mr. H. E. Smith was elected president and in 1889 Mr. C. P. Fox, late professor of agriculture in Moscow, Idaho, now taking his degree of doctor of science in agriculture at O. S. U., was elected president. During the next few

years that followed O. S. U. was without literary work in the Agricultural Department, but it was not long to remain so, for in 1890 seven young and energetic students, Messrs. Richardson, Stump, Baker, Fisher, Rane, Powell and Bloomfield, learning the needs of a higher education among agricultural workers, met and formulated a plan by which they could advertise and further the interests of the Agricultural Department of the university. They proceeded at once to put in operation these plans by having printed a number of circulars setting forth the advantages to be found in the Agricultural Department of the university, and sent them out to young men who were likely to be interested in the work. The result was a larger attendance in the department during the next few years. Encouraged by the additions of new students and knowing the needs of agricultural students to attain literary work, there was a called meeting in January, 1893, in the reading room of Horticultural Hall, where a society was formed known as an Association of Agricultural Students, and elected Mr. Chas. W. Burkett, now assistant in the Department of Agriculture, O. S. U., as their president, and Mr. E. J. Riggs, now of the New Hampshire Agricultural College, as secretary. Meetings with literary programs were held every two weeks. This proved of much benefit to the students of agriculture. It gave them an opportunity to carry out such literary work as came in their department and which was conducive to their best interests.

In January, 1894, Sherman Hood was elected president and held that office until he graduated in the following June.

In September, 1894, Renick W. Dunlap was elected president. The society was now a little more than one and one-half years old, and in that time great advancements had been made and it was concluded to amend the constitution. So the officers were elected every term instead of once a year. And they also began to feel as though the old name of "Association of Agricultural Students" meant too little and it was finally chang-

ed to Townshend Agricultural society, with weekly literary meetings. The society was named after Professor Dr. N. S. Townshend, who, for a quarter of a century was connected with O. S. U. in the Agricultural Department. No name would have been so well received. For to those it would be sacred who had been fortunate enough in former years to be under his instruction, who had learned to love him for his kindness and respect him for his ability and who had profited by his kind council and fatherly advice and his ready willingness to administer to the sick and needy.

During the years that followed the following persons were elected president of Townshend society:

Winter term of 1895, D. A. Crowner, now of the Ohio Experimental Station.

Spring term of 1895, E. J. Riggs, now of the New Hampshire Agricultural College.

Fall term, 1895, F. M. Randolph; teaching and farming at Summerset, Ohio.

Winter term, 1896, Philip Piarr, just returned from Europe, where he was taking special study.

Spring term, 1896, Frank Ruhlen, superintendent of A. R. Van Cleave's dairy farm, Mentor, O.

Fall term, 1896, Philip Baer. Has charge of Gratiot Creamery Co., Gratiot, Ohio.

Winter term, 1897, Homer C. Price, dairy farm at Newark, O.

Spring, 1897, Marley R. Shellabarger, farmer at Garland, Ohio.

Fall term of 1897, the beginning of the present year, Mr. John C. Britton, who will graduate June next, was elected president.

Winter term, 1897-'98, W. C. Mills was elected president.

The meetings of Townshend society are held on Friday evening each week and draws its membership from the agricultural and domestic science departments of the university, and has upwards of 60 active loyal and interested members.

The literary work of the society is varied. Entertaining papers on historical

subjects, original research in entomology, botany, ornithology and original observations are all subjects pertaining to the department. Debates on the leading questions of the day and extemporaneous speeches and topics of the times furnish the programs.

Through the work in Townshend "The Agricultural Student," a monthly magazine of the highest scientific order, has been founded and is doing much in sending out to the world the grand work in the various departments of the university. And it was directly through the literary work of Townshend society that this flourishing magazine received life. Townshend society has never had a home until now. It first met in Horticultural Hall and the room soon became inadequate for the growing society and the lecture room in Botanical Hall was secured, but now we have this beautiful home, and you may expect to find Townshend society furthering the interests of its members and the departments which it represents and doing better and higher work than ever before. The latch string of Townshend Agricultural society always hangs out to students and their friends and to strangers and visitors you have a cordial welcome.

Note—Mr. Mills is well qualified to write a history of agricultural literary work in the Ohio State University. Having attended the university when the first movement was made in 1883, he has watched with interest the gradual growth of the work of this flourishing department. The above is the only complete history we have seen of the literary work of this department.—[Ed.]

Some Greenhouse Pests.

BY PROFESSOR JAS. S. HINE.

(Continued from January Number.)

Heliothis armiger, Hbn. Order Lepidoptera; Family Noctuidae—The larvae of this species has caused some annoyance during the past year by its appearance in great numbers upon plants in Columbus greenhouses.

They have injured geraniums, carnations and abutilons. The first named plants were injured most. The larvae

feed differently on geraniums than on corn, cotton and tomatoes, for instead of boring into some part of the plant they usually feed on the leaves. A few instances were observed, however, where the stem was bored, and oftentimes the blooms were attacked and badly disfigured. I saw an instance where young plants from cuttings were almost defoliated in a few days.

The large larvae injure carnations by boring into the buds and feeding upon the undeveloped flowers. Buds injured in this way soon turn brown.

In only a few instances did I observe specimens feeding upon the leaves or abutilons. It is evident that this is not a desirable food plant for the larvae, but the species seems to be one that can become adapted to circumstances very easily. Specimens, as a rule, get into greenhouses by being carried in on plants, either in the egg or larva state. The fall brood of moths appear and lay their eggs on geraniums or other plants, near the time these are removed to winter quarters. The result is the eggs or very young larvae go with the plants and pass their life cycle in the greenhouse.

The larvae may be hand picked, or they may be controlled by spraying with the arsenical solutions.

Spilosoma virginica, Fabr. Order Lepidoptera, Family Arctæidae—The larvae of this species was taken on chrysanthemums. It has the peculiar habit of climbing to the top of the stem and eating the lower petals from the opening flowers. In this way it may cause serious damage. The leaves are oftentimes attacked also. The pest is all the more serious as it does a great deal of its work in the night, and remains in hiding during the day.

Handpicking seems to be the most practical remedy for this species.

Peridroma saucia, Hbn. Order Lepidoptera; Family Noctuidæ—The climbing cutworms are annoying in the greenhouse as well as in the orchard. The species in question, the variegated cutworm, is one which is able to procure food under varying conditions. At one time we find it in the orchard eating the

leaves of fruit trees, at another feeding upon the foliage and stems of herbaceous plants in the greenhouse.

That which I desire to mention at this time is the habit which the larva has of injuring smilax. About the middle of last February the leaves of smilax in one of the city greenhouses were found to be seriously injured. The proprietor was at a loss to know the cause of injury for a time, but by observation, great numbers of larvae were found under the chaff which had been used as a mulch for the plants. Soon these larvae were associated with the injury, and it was found that they climbed the plants and ate preferably the younger leaves at the top.

Like other cutworms, this species does its mischief in the night and remains concealed during the day. For this reason their injury is often a surprise to the gardener.

The species can be easily controlled by using Paris green in bran, mixed to the consistency of a stiff paste with sweetened water. The proposition of Paris green to bran is not important, but one ounce of the former to three pounds of the latter does the work. If this mixture is placed in small piles between the rows of smilax the larvae eat it in preference to the foliage and are thus destroyed.

Orthesia insignis, Douglas. Order Hemiptera; Family Coccidae—This species is one of the scale insects, but is peculiar in that, instead of secreting a scale which covers its whole body, secretes a scale in the form of a sack which is carried at the caudal end of the body. This sack receives and protects the eggs until they hatch, and for this reason Mr. Lounsbury refers to it as the marsupium.

In an exhaustive paper on the genus *Orthesia*, sent out by the Massachusetts Experiment Station a few years ago, the life history of *insignis* is carefully worked water. The proportion of Paris green having a wide distribution in the eastern states.

From its appearance and manner of attacking plants, one concludes at once that *O. insignis* is a near relative of the mealy bugs.

Some time during the winter of 1895, Mr. Bogue, then a student at the univer-

sity, brought in specimens of a scale insect which he found on coleus in a greenhouse in the city. He had some trouble in identifying the species, but finally associated it with insignis, which he found described and figured in Mr. Lounsbury's paper referred to above.

It was present the past winter in the same greenhouse on colias and acaranthus. I could not find it on any other plants, although I spent some time in trying to do so.

The young, at first, are much like young mealy bugs, but soon begin to secrete scales, and thus change their appearance, so that they may easily be identified. These young as soon as hatched distribute themselves over the plant, insert their beaks, and begin the work of destruction at once.

The most satisfactory remedy for this insect is fir tree oil. If this substance were not so expensive florists would find in it a very satisfactory remedy. Coal oil emulsion, when well made, gave fair results, but is not as effective as the first named substance.

Paradesmus dasys, Bollman. Order Diplopoda; Family Polydesmidae—Not a great number of species of myriapods have been reported as injurious to cultivated plants. Dr. Fitch enumerates, among garden insects, what he calls the flattened centipede. Dr. Lintner reports instances where *Julus caeruleocinctus*, Wood, has been observed eating potato vines, and even burrowing into the seed tubers six inches below the surface of the ground; and Professor Forbes has found *Cambala annulata*, Say, the strawberry centipede, feeding upon the strawberry plant in Illinois.

The species in question was described by Charles Harvey Bollman in 1887, from specimens collected in a hot house at Baltimore, Maryland, by Charles L. Edwards, of Johns Hopkins University. Bollman's description, which was first published in Vol. X, Proc. U. S. Nat. Mus., is as follows:

DIAGNOSIS.

"Very similar to *Paradesmus gracilis*, but the tibiae and tarsi of the male tuberculate beneath; vertex pilose on each side

of the sulcus, first and penultimate segments with two rows of setae, rest with one; copulation foot resembling that of *gracilis*.

Type—U. S. National Museum.

Habitat—Baltimore, Maryland.

This species is very closely related to *gracilis*, as shown by the character of the genitalia, but is at once recognized by the character given in the diagnosis. The following differences were also observed, which, except the characters of male genitalia, are not of much importance: Dorsal plates somewhat wrinkled; repugnatorial pore ((as compared with Soussure's figure of *P. coarctatus*=*P. gracilis*) not placed so far back nor the lateral carina so swollen; the end of the sheath inclosing the flagellum finely serrate as well as its branch; the other lobe widely 3 or 4 toothed; length of body, male 15.5 to 20 mm., female 17 to 22.5 mm."

I have not been able to find any published statement of the occurrence of the species in other localities, but as I have found it in all the Columbus greenhouses that I have visited, it probably has a wide distribution.

In Bulletin 46, of the U. S. Nat. Museum, page 187, the statement is made that the species is an introduced one and is found only in hothouses. When it was first introduced into this country, I am unable to say, but from its habits I think I am safe in saying that it was probably brought over with potted plants and transported from one part of the United States to another in the same way.

HABITS.

On the 10th of November, 1886, my attention was called to some fine varieties of *Adiantums*, which were reported to be receiving injury from some unknown source. It did not take very close observation to locate, what I supposed to be the cause of the injury, for one could see great numbers of millipedes, as well as smell their characteristic odor, as soon as one of the pots, in which the plants were growing, was lifted from its place.

I soon satisfied myself fully that the numerous specimens observed were the

sole cause of the injury and went to work to find out something regarding their habits. I found that these millipedes, as other related forms, feed in the night, and conceal themselves during the day in moist places on the sides and beneath the pots. Their habit of feeding on *Adiantums* is peculiar, but one which is productive of the greatest injury possible; for they eat only the young, spiral-like fronds, the first night after they appear above the surface, consequently no new leaves are developed, and as the old ones soon fade, it is not long before the plants are rendered unsightly.

REMEDIES.

The remedies for myriapods in green-houses are very simple, especially where plants are growing in pots. The pots may be moved and the pests killed with kerosene or hot water; then the pots may be replaced. It is well known that these animals collect under rubbish on the surface. Therefore, by placing short boards at various places over infested territory many specimens may be induced to collect under them, where they may be collected and killed.

In the case under consideration the pots were removed, the ballast in the benches was taken out, and the benches themselves thoroughly sprayed with kerosene and water in the proportion of one part of the former to four parts of the latter. Specimens that concealed themselves on the inside of the pots were killed by using kerosene emulsion of one-sixth strength. This was not put on the foliage, but only on the surface of the ground in the pots. This done, new ballast was furnished and the pots replaced. Not every one of the millipedes were killed by this operation, but they were so scarce after the treatment that no injury to the plants was perceptible. Only in extreme cases is it necessary to resort to such thorough treatment. At other times one of the simpler remedies mentioned above is effective.

A List of Birds Recorded for the Ohio State University Farm and Campus by the Wheaton Ornithological Club.

1. *Podilymbus podiceps*, Pied-billed Grebe. September.
2. *Branta canadensis*, Wild Goose. March.
3. *Botaurus lentiginosus*, Bittern. November.
4. *Ardea herodias*, Great Blue Heron.
5. *Ardea virescens*, Green Heron. Common.
6. *Philohela minor*, Woodcock.
7. *Totanus solitarius*, Solitary Sandpiper. Not common.
8. *Actitis macularia*, Spotted Sandpiper. Common.
9. *Aegialitis vocifera*, Killdeer. Common; breeds.
10. *Colinus virginianus*, Quail; breeds.
11. *Zenaidura macroura*, Turtle Dove; abundant; May 27, a set of three eggs.
12. *Cathartes aura*, Turkey Buzzard.
13. *Accipiter cooperi*, Cooper's Hawk.
14. *Buteo borealis*, Red-tailed Hawk.
15. *Buteo latissimus*, Broad-winged Hawk.
16. *Falco sparverius*, Sparrow Hawk. Common; breeds.
17. *Pandion haliaetus carolinensis*, Fish Hawk. Observed by Mr. C. B. Morrey during the high water of spring.
18. *Megascops asio*, Screech Owl. Common; breeds.
19. *Coccyzus americanus*, Yellow-billed Cuckoo. Common; breeds.
20. *C. erythrophthalmus*, Black-billed Cuckoo. Rare.
21. *Ceryle alcyon*, Kingfisher. Common; breeds.
22. *Dryobates villosus*, Hairy Woodpecker.
23. *Dryobates pubescens medianus*, Downy Woodpecker. Breeds; commoner than No. 22; with it, frequently termed "Sapsucker."
24. *Sphyrapicus varius*, Yellow-bellied Sapsucker. A migrant, becoming abundant at times.
25. *Melanerpes erythrocephalus*, Red-headed Woodpecker. Abundant; breeds.
26. *Melanerpes carolinus*, Red-bellied Woodpecker. Not uncommon.

27. *Colaptes auratus*, Flicker or Yellow-hammer. Common, breeding.

28. *Anrostomus vociferus*, Whip-poor-will.

29. *Chordeiles virginianus*, Night-hawk.

30. *Chaetura pelagica*, Chimney Swift, or Chimney Swallow.

31. *Trochilus colubris*, Hummingbird.

32. *Tyrannus tyrannus*, Kingbird. Common, breeds.

33. *Myiarchus crinitus*, Crested Flycatcher. Its harsh notes may be heard on the campus any day in the latter part of May or in June.

34. *Sayornis phoebe*, Pewee or Phoebe.

35. *Contopus virens*, Wood Pewee. Apparently more common than the preceding species.

36. *Empidonax traillii alnorum*, Alder or Traill's Flycatcher. Breeding commonly along the river and old river bed in June. During the spring of '96 eleven nests were observed. They were generally placed a few feet from the ground in willow thickets, four being the usual complement of eggs.

37. *Otocoris alpestris praticola*, Prairie Horned Lark. Occurring in the winter in scattered flocks.

38. *Cyanocitta cristata*, Blue Jay. Common, breeds.

39. *Corvus americanus*, Crow.

40. *Dolichonyx oryzivorus*, Bobolink.

41. *Molothrus ater*, Cowbird. Common singly and in flocks. On the farm, eggs of this species have been taken in nests of the Song Sparrow, Summer Yellow Bird, Red-eyed Vireo, Red Bird and Indigo Bird.

42. *Agelaius phoeniceus*, Red-winged Blackbird. Breeds in numbers along the old river bed.

43. *Sturnella magna*, Meadow Lark.

44. *Icterus spurius*, Orchard Oriole.

45. *Icterus galbula*, Baltimore Oriole. Breeds commonly.

46. *Scolecophagus carolinus*, Rusty Blackbird. October.

47. *Quiscalus quiscula aeneus*, Common Blackbird. Nesting almost by hundreds in the evergreens about the orchard.

48. *Carpodacus purpureus*, Purple Finch.

49. *Spinus tristis*, Wild Canary; This-tle Bird.

50. *Spinus pinus*, Pine Siskin. May.

51. *Passer domesticus*, English Sparrow, breeds.

52. *Pooecetes gramineus*, Vesper Sparrow.

53. *Ammodramus sandwichensis savanna*, Savanna Sparrow. September.

54. *Zonotrichia leucophrys*, White-crowned Sparrow. Common spring migrant.

55. *Zonotrichia albicollis*, White-throated Sparrow. Common fall and spring migrant.

56. *Spizella monticola*, Tree Sparrow.

57. *Spizella socialis*—Chipping Sparrow or Chippy; breeds.

58. *Spizella pusilla*, Field Sparrow.

59. *Junco hyemalis*, Snow Bird. Abundant.

60. *Melospiza fasciata*, Song Sparrow. Abundant; breeds; complete sets as early as April 20.

61. *Melospiza georgiana*, Swamp Sparrow. Rare.

62. *Passerella iliaca*, Fox Sparrow. Rare.

63. *Pipilo erythrophthalmus*, Ground Robin, Towhee or Chewink. Resident, not uncommon.

64. *Cardinalis cardinalis*, Red Bird; breeds.

65. *Habia ludoviciana*, Rose-breasted Grosbeak.

66. *Passerina cyanea*, Indigo Bunting; breeds.

67. *Spiza americana*, Dickcissel.

68. *Piranga erythromelas*, Scarlet Tanager.

69. *Progne subis*, Purple Martin.

70. *Chelidon erythrogaster*, Barn Swallow.

71. *Ampelis cedrorum*, Cedar Bird.

72. *Lanius ludovicianus excubitorides*, White-rumped Shrike. Occasional.

73. *Vireo olivaceus*, Red-eyed Vireo. Breeds.

74. *Vireo gilvus*, Warbling Vireo. Migrant.

75. *Vireo solitarius*, Blue-headed Vireo. Rare migrant; May.

76. *Mniotilta varia*, Black and White Creeper. A common fall and spring migrant.
77. *Helmintherus vermivorus*, Worm-eating Warbler. Rare migrant, April.
78. *Helminthophila pinus*, Blue-winged Warbler.
79. *Helminthophila peregrina*, Tennessee Warbler. Rare migrant; October.
80. *Dendroica tigrina*, Cape May Warbler. Rare; a single specimen in September.
81. *D. aestiva*, Summer Yellow Bird. Abundant, breeds in the orchards and along the river.
82. *D. caerulescens*, Black-throated Blue Warbler. Rare; May.
83. *D. coronata*, Myrtle Warbler.
84. *D. maculosa*, Magnolia Warbler; May.
85. *D. pensylvanica*, Chestnut-sided Warbler.
86. *D. castanea*, Bay-breasted Warbler. Fall migrant; not common.
87. *D. striata*, Black-poll Warbler. Abundant fall migrant.
88. *D. blackburniae*, Blackburnian Warbler. Migrant; May.
89. *D. virens*, Black-throated Green Warbler.
90. *Geothlypis trichas*, Maryland Yellow-throat. Common along the river.
91. *Icteria virens*, Yellow-breasted Chat. Breeds.
92. *Setophaga ruticilla*, Redstart.
93. *Galeoscoptes carolinensis*, Catbird. Breeds.
94. *Harporhynchus rufus*, Brown Thrush. Breeds.
95. *Thryothorus ludovicianus*, Carolina Wren.
96. *Troglodytes aedon*, House Wren.
97. *Troglodytes hiemalis*, winter Wren.
98. *Certhia familiaris americana*, Brown Creeper. Remains over winter.
99. *Sitta carolinensis*, White-breasted Nuthatch. Throughout the year.
100. *Sitta canadensis*, Red-breasted Nuthatch. April and May.
101. *Parus bicolor*, Tufted Titmouse.
102. *Parus atricapillus*, Chickadee.
103. *Regulus satrapa*, Golden-crowned Kinglet. The common species.
104. *R. calendula*, Ruby-crowned Kinglet. October.
105. *Polioptila caerulea*, Blue-gray Gnatcatcher. Recorded for November 20.
106. *Turdus mustelinus*, Wood Thrush. Common; breeds along the river.
107. *T. aliciae*, Gray-cheeked Thrush. September and October.
108. *T. ustulatus swainsonii*, Olive-backed Thrush. October.
109. *T. aonalaschikae pallasii*, Hermit Thrush.
110. *Merula migratoria*, Robin. Breeds.
111. *Sialia sialis*, Bluebird.
- A species of swallow, probably *Stelgidopteryx serripennis*, nests in the banks along the river, and a rail (*Rallus Virginianus*?) has been observed in the old river bed.
- [Note—This list has been compiled from records in the possession of the Wheaton club. Unless otherwise stated, all observations have been made by members of the club. Lack of space prevents full notes and due credit to different observers. Only those species of which nests or fledglings have been observed are recorded as breeding. Additions to the list will be printed in the "Student" from time to time.
- E. B. WILLIAMSON, Pres.]

Higher Education in Agriculture.

(F. W. Taylor, at the Sixth Annual Meeting of Townshend Agricultural Society.)

What is usually understood as "higher education" is a broader and deeper insight and knowledge of a subject than is recognized and made use of in its application.

Higher education in agriculture, then, is advanced knowledge concerning the methods commonly practiced by farmers in the pursuit of their occupation.

Agriculture, in its broadest definition, is the art or science of cultivating the ground; planting the seeds; raising and

harvesting the crops; together with the rearing, feeding and management of live-stock. All these processes are carried on in order to meet the continual wants and necessities of mankind, and in view of the extensiveness, magnitude and importance of agriculture to the human race, one cannot fail to be struck with the peculiar wisdom of Deity in assigning to man this occupation.

It was while in the sinless perfection of his original nature that his god-like intelligence enabled him to give appropriate and indicative names "to all cattle, and to the fowl of the air, and to every beast of the field," and so clear and just was His perception that "whatsoever He called every living creature that was the name thereof."

As Emerson says, "The first farmer was the first man, and all historic nobility rests on the possession and use of land."

But it is not within the province of this brief paper to give a history of the development of agriculture, but to show the prominence, value and dignity of it today, and the necessity for its further advancement. It ranks fairly among the learned professions. Its prominence is recognized by the nation in its congressional capacity by the aids it has extended towards its improvement; by the state in their legislative appropriations and encouragement; and by the people in general through the attention they show to its implements, economics, labors and results. The indispensable necessity of an advanced agriculture to the wealth and comforts, and in fact to the very existence of a great nation, renders it an object peculiarly worthy the attention and regard of all. In looking at the history both of ancient and modern states, we find that wherever a people has risen to any great eminence, they have diligently encouraged and protected their agricultural classes.

It is the duty of every intelligent, patriotic American citizen to thoughtfully study and fully understand the conditions of American agriculture, and to become thoroughly acquainted with the needs of American farmers. We must remember

that there are in this country 5,000,000 farms on which 10,000,000 farmers toil continually; we must remember that one-half the population of this country is dependent entirely upon the fruits of their labor, and that the prosperity of all other industries depends on their well-being; we must remember also that it was through the efforts of agricultural labor that the bonds of this country were redeemed from the hands of foreign bondholders; and that today 75 per cent. of all our exports are the products of agriculture.

Yet in the face of these facts, reckoning agriculture as representing the greatest interest in our domestic affairs, how deplorable it seems when we remember that it is the one of our national departments endowed with the smallest appropriations and receiving the least consideration.

But despite this last statement, the farmer is progressing, which fact a little comparison readily shows. Scarcely more than 50 years ago agricultural periodicals did not exist on the American continent; the profession of the farmer was without official recognition; his calling laborious, and his elevation to the higher responsibilities of government, science, literature and professional life attainable only with great difficulty, chiefly because education with her promotions had not contributed her full share of benefits to his demands. But the need of a higher and more liberal education for the farmer has been recognized, and today throughout our broad land, every avenue to social and political distinction is as fully open to farmers as to any of our citizens.

The farmer has found a place in our political, economic and scientific circles. "The farmer in politics has come to stay, and in spite of the possible blunders on the part of men untried in the conduct of public affairs, the presence and influence of the farmer in politics will certainly prove beneficial to the country at large." Labor finds in the hard working farmer ready sympathy—the genuine, practical sympathy of a man who is himself accustomed to labor for many months of the

year from dawn till sunset, and who is not likely to be carried to extremes in advocating Utopian theories regarding the privileges and rights of labor.

Today greater attention is being given to agricultural interests and education, especially in lines which will better fit the farmer for his particular calling, and for taking positions of greater influence in society. Labor-saving implements greatly relieve him of that exhausting bodily labor which so unfits man for intellectual exertion.

In agriculture as well as in the manufactures, inventions which come from increased knowledge have so cheapened production of every sort, that the world we live in now is quite different from the one of 50 years ago. Machinery has so multiplied the power of a single man to cultivate, harvest and transport crops, that a bushel of wheat can be raised and put into flour in Minneapolis and shipped to New York for less than it cost our forefathers to carry it 50 miles. Owing to these great improvements and cheap transportation the element of distance between the producer and consumer is practically eliminated.

Much is written nowadays about careless farming. Although this may be true, it is equally true that the farmer raises more crops and better stock than he did 25 years ago, and we can certainly expect still greater advance in that science and practice in the years that are to come. Since the greater part of our arable lands are now occupied, the population is growing more rapidly than the area of cultivated ground, so that we may look for the time in the future when the demand for food will equal the supply; the stringency will then cease and the farmer will receive a greater reward for his labor.

One of the most interesting sociological phenomena which we observe today is the rapidity with which science is being diffused among the agricultural classes of our country and applied not only in improvement of farm practice but in the elevation of farm life. Twenty years ago the press, the public and the "practical farmer" were wont to speak slightly of "scientific farmers"; today

a farmer is 20 years behind his time if he does not know something of nitrogen, phosphoric acid and potassium; of the values of fertilizing materials; of the differences of soils; of the adaptation of fertilizers to soil and crop; of the relative merits of commercial fertilizers and farm manures; of the different methods of applying manures; and of many other kindred topics.

The value of availability of commercial fertilizers have been steadily growing, and under the care and direction of expert scientists and chemists the vast storehouses and laboratories of nature are being opened, and the secrets of her processes applied to the advancement and higher education of our present-day agriculture.

Phosphates from rock and potash from mines are already taken very cheaply, and it is said that some German investigators are about to perfect processes for drawing upon the vast stores of nitrogen in the air, so as to make that most expensive element of plant food as cheap as the others. Prof. Nobbe, of Saxony, the distinguished plant physiologist, claims that he has produced on a commercial scale, pure cultures of the different bacteria which are efficient in fixing the nitrogen of the soil in a form available for plant food, and that the soil can be inoculated with the organisms for the modest sum of \$1.25 per acre. As was indicated by Prof. Wiley in his lecture here at the dedication, the gap between organic and inorganic chemistry is being bridged over, and synthetic chemistry has gone so far as to predict a time when fruits and grains will be produced at little expense in the laboratory from their original elements, instead of waiting for the slow processes of nature to perfect them. Of course we should not be too credulous concerning all these new methods and predictions, yet we may reasonably expect much from the many men of thought and scientific caliber now engaged at our experiment stations and elsewhere, in studying the laws of plant life and development.

We have little hope that the time will come when man will cease "to earn his bread by the sweat of his brow," as he did in the balmy days before "the fall," but

he will certainly earn it with less sweat than he does now.

Our experiment stations may, perhaps, be regarded as our most thorough and useful advocates and promoters of higher agricultural education. It is worth our while to stop here a moment and see what they are and what they are doing. These stations cost annually about \$1,000,000—three-fourths of which amount comes from the national treasury. The whole sum involves the use of but 30 cents for every \$1000 worth of the agricultural production of the country.

Nearly 600 persons are engaged in this work, and about 5,000,000 copies of more than 450 publications are annually distributed by them. It is less than 25 years since the first station was established in this country, and now there is one in operation in every state and territory of the Union. They serve as bureaus of information to which the farmer can turn for advice in matters of practical interest. They have helped to introduce improved processes, new crops, new breeds of livestock, and new agricultural industries. They have given important help to the farmer against the outbreak of insects and diseases which attack his crops and animals; and best of all they have made tests and experiments from which to deduce principles to be used as the basis of agricultural practice. The experiment station is not a model farm nor a money-making farm, but a field of investigation. The ordinary field work is not to raise big crops, but to ascertain vital principles, the applications of which are to benefit the farmer at large. Knowledge, and practical knowledge too—of those principles is needed more and more as the struggle for existence becomes more complex and more strenuous. The farmer must study for himself and discover how to make an intelligent adaptation of the teachings of science to his own special case. And in this study, as has been indicated, he needs all the aid he can get from experts whose lives have been devoted to the solutions of the problems of agriculture.

It is universally admitted that the study of the natural sciences should have a place in the curriculum of every public

school in the country, if for no other reason than as a factor for wholesome intellectual development.

In our high schools and colleges the principles of astronomy are taught, not because the students expect to become expert astronomers, but simply to broaden their field of view and exercise their powers of thought and imagination.

The elements of chemistry, physiology, botany and geology and other sciences are taught largely to discipline the mind and furnish it with material for use in civilized society. And there is no reason why the study of agricultural science should not be recognized for its value in furnishing mental training and exercise. No branch of study would have a more immediate effect in establishing habits of careful personal observation, and certainly one familiar with the elements of this science would derive a life-long pleasure from it even if he never made any direct practical use of it. One who has an intelligent idea of what is going on in the orchards and gardens, grain fields and pastures in the country around him is more adequately equipped and lives a fuller and better life than he does to whom all the procedures of farm life are mysteries.

Let us then learn to cultivate that habit of practical observation, adjust ourselves to new surroundings, take advantage of every opportunity which science affords, work intelligently and economically, do a little more tomorrow than we did today, and live with a purpose of universal usefulness, remembering as some one has said that "Man is a benefactor to his race who makes two blades of grass grow where one grew before."

Prize Contest.

Through the generosity of D. M. Osborne & Co., of Auburn, N. Y., a prize of any machine manufactured by them is offered to students in the College of Agriculture of the Ohio State University. Undergraduates who have completed the year work in Farm Equipment, Soils and Crops are eligible to enter the contest. The prize will be awarded by Director Roberts of Cornell University to the student presenting the best thesis of not more than eight thousand nor

less than five thousand words on the subject "Cultivation and Harvesting of Indian Corn." When we consider that more than one-third of the tillage area of the United States is planted to Indian corn, and that comparatively little attention has been given to improved methods of handling this great crop, the subject becomes at once important. D. M. Osborne & Co. are to be congratulated on the interest they have shown in the development and improvement of corn harvesting machinery. Their generous offer has met with the hearty approval of the students, and doubtless the contest will be spirited and bring out a high class of work from those who enter.

Horticultural.

We are in receipt of a valuable catalogue containing 168 pages magazine size, about fifty pages devoted to seeds, sixty to plants, a few to ornamental trees, shrubs and vines, and the balance to the cream of the fruits. This comprehensive catalogue is issued at Painesville, Ohio, by the Storrs & Harrison company, whose integrity and reliability are unquestioned. Send your address to them on a postal and it will be sent free.

We have received a copy of the beautiful 100-page illustrated catalogue of A. W. Livingston's Sons. This pamphlet is in magazine form and copiously illustrated both with colored plates and in black and white. It contains descriptions of the splendid stock of TRUE BLUE flower, vegetable and farm seeds, flowering bulbs and plants, seed potatoes, etc., which this reliable firm is always prompt to furnish. These catalogues may be had by sending to A. W. Livingston's Sons, Columbus, Ohio.

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Forty Harvest Seasons.

Forty years ago the Marsh harvester, the forefather of every successful grain or corn binder, was invented. The history of the development of the harvesting machine is told in the annual catalogue of the Deering Harvester Co., Chicago. This new catalogue is one of the most complete we have seen, which this company or any other has issued. It not only contains the description of the various machines put out by this company, but the history it gives us is most valuable for reference and preservation. As a matter of statistics we may get a little idea of the marvelous growth of the Deering Harvester Co., one of the most progressive and successful manufacturing companies of the world by the following: In 1858 employed 6 men, shipped one-half carload of machines; in 1878 employed 400 men, shipped 371 carloads of machines; 1897 employed 3500 men, shipped 6000 carload of machines.

The Deering is the successor of the old Marsh Harvester Company and the credit of developing the twine binder and the successful application of roller and ball bearings is due to this company. A copy of "Forty Harvest Seasons" will be sent free by writing the company.

A Text Book of General Botany, by Carlton C. Curtis. Longmans, Green & Co., New York.

That the author is competent to prepare such a work is signified by the fact that he is tutor in botany in Columbia University—one of the foremost universities in the world of biology.

This book, the author says, is intended as an introduction to the study of botany and is not intended as a substitute for any of the numerous volumes that are adapted to the use of those who can put

but a small amount of time upon the study. The text is based upon the laboratory work of beginners at Columbia; in fact an exposition of this work supplemented by lectures and prescribed reading. Each minor division of the book has its literature prescribed, and in this alone the book is unusually valuable.

The book is divided into four general divisions or chapters. Chapter I concerns the anatomy of the plant body. It discusses in detail the cell and its contents, and all formation and growth.

Chapter II is on plant physiology. Plant foods, the principal products of cell activity, the irritability of plants, propagation and reproduction are fully discussed in this chapter.

Chapter III is upon systematic botany and morphology.

Chapter IV is upon paleobotany.

The book seems to be well indexed, and is a good, sound work for the use of the student of general botany.

Quo Vadis. By Herr Sienkiewicz. Boston; Little, Brown and Company. This intense, interesting narrative of Nero's time is one of the strongest historical romances that has been written in the last half century. The book describes Rome, grand and awful in her last throes. Every chapter is eloquent in meaning and so convincing and intense that it must be placed even above *Ben Hur*. In "*Quo Vadis*" the author gives us pictures of opening scenes in the conflict of moral ideas with the Roman Empire—a conflict from which Christianity issues as the leading force in history. "*Quo Vadis*" is undoubtedly the most absorbingly interesting and brilliant book of the year. It is a great and inspiring book, that is exerting a mighty influence for good. It is sold by all booksellers.

Audubon and His Journals. By Maria R. Audubon, with Zoological and other notes by Elliott Coues: two volumes. New York: Charles Scribner's Sons.

The granddaughter of the great ornithologist claims that heretofore no correct biography of her grandfather has been published. She expresses her wish to let the man speak for himself and so

writes but briefly of his life, the most of the work from her hands being the journals of Audubon made in Europe and America. The wonderful gift of Audubon in drawing the birds that he studied made his work more valuable than that of any other ornithologist America has possessed. He was at infinite pains to make these drawings accurate, and his whole life was wrapped up in his enthusiasm for nature. The journals are of absorbing interest to the ordinary reader to say nothing of their great value to the scientist. They occupy two large volumes handsomely printed and illustrated with examples of Audubon's drawings, many fine portraits of himself and his family, and several drawings and photographs of places of interest in connection with the life of the great naturalist.

The Wild Flowers of California, by Mary Elizabeth Parsons, illustrated by Margaret Warriner Buck. Published by William Dorey, San Francisco, Cal. Price \$2.00. An attractive work setting forth the names, haunts and habits of the many beautiful and rare flowers peculiar to California. The flowers are described in their homes, on seashore and mesa, in deep, cool canon, on dry and open hill slope, on mountain top, in glacier meadow, by stream and lake, in marsh and woodland. This is one of those rare books that combines science and pleasure, that changes study from dry monotony to fascinating pleasure.

As many of the species extend up into Oregon and Washington, this book presents a very fair botany, not only of California, but of the Pacific slope.

The author makes use of Mrs. Dana's plan of grouping all the white flowers into one section, the yellow into another, the pink into another, etc., which greatly facilitates the determination of a flower in the absence of a key.

The illustrations by Margaret Warriner Buck are beyond criticism.

Birds of Village and Field. By Florence A. Merriam. Boston. Houghton, Mifflin & Co.

This little volume of over 400 pages is strictly a bird book for beginners.

Much of the pleasure and the beauty and the charm of country life is due to the birds and the flowers. But how few of us know anything about them. They are right before us all the while for us to study. The country abounds with them; and the cities with their cemeteries and parks offer rare opportunities for bird study.

The question is, then, not that of finding the birds, but of naming them. Here is where the rub begins. But the author realizing the disadvantages of learning the birds by name, has given us in this volume a means of knowing them without the aid of the gun. There is nothing difficult in following the author in her study. The illustrations are fine, and have been taken from some of our most authentic drawings. This is a splendid book to put into the hands of the young.

From September to June With Nature, by Minetta L. Warren. D. C. Heath & Co., Boston. Price 35 cents.

This little book is written in a simple, plain style, and is intended to instill a spirit of observation into children. Not to give information alone, or to tell the child what he can find out, but to arouse his interest, to excite his curiosity. In short the desire of the author appears to be to prevent the increase of a type best illustrated by Peter Bell, to whom

"A primrose by the river's brim,
A yellow primrose was to him;
And it was nothing more."
It is a good book for children.

Conversations on Animal Life, by Andrew Jackson Howe: Robert Clarke Company, Cincinnati. Price \$1.50.

The name of this book is an explanation of its contents. Animal life, in its various forms is discussed in a semi-scientific, plain, conversational manner. The text is attractively illustrated by cuts. The subject of animal life is taken up rather systematically, beginning with radiata and going through mollusca, articulata and vertebrata. Articulates are considered in several chapters, and the different classes of vertebrates are considered separately—fishes, reptiles, birds, etc. The later part of the book is devoted to special animals, their natural history and habits. The illustrations are good,

showing the animals in their natural habitat, and in characteristic positions.

The book is bound in durable cloth, nicely decorated.

First Principles of Agriculture, by Edward B. Voorhees, A. M. Silver, Burdette and Company, Boston.

The standing of Professor Voorhees, director of the New Jersey Agricultural Experiment Station, and professor of agriculture in Rutgers College, is such as to warrant his works worthy of our attention as students and practical farmers.

This work states in a plain and simple manner the elementary principles of scientific agriculture, and shows the direct relation of facts to practice upon the farm.

No attempt is made to cover in detail all of the branches relating to agriculture, but the book deals with everything in a scientific manner as far as it goes.

The mission of this work is that of a text book and when we say that it is plain, clear and correct in its statements and sound in its logic, it will be understood that it fulfills its purpose.

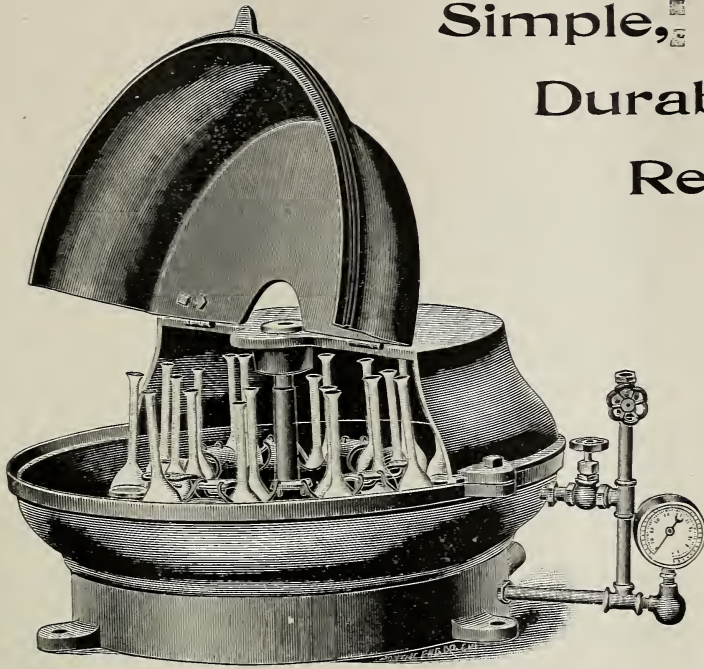
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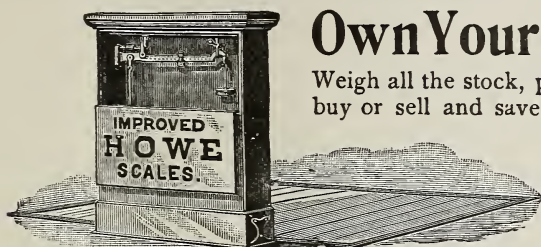
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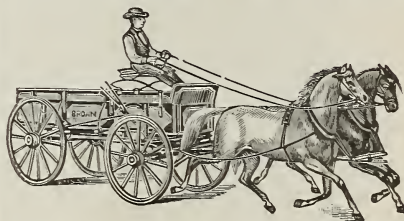
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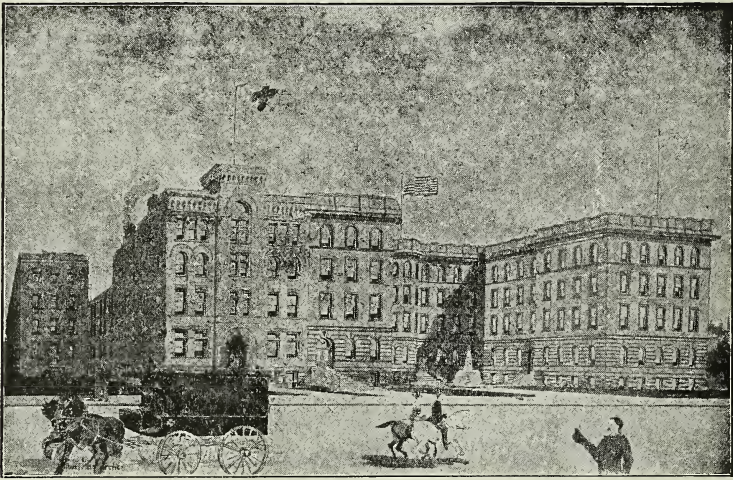
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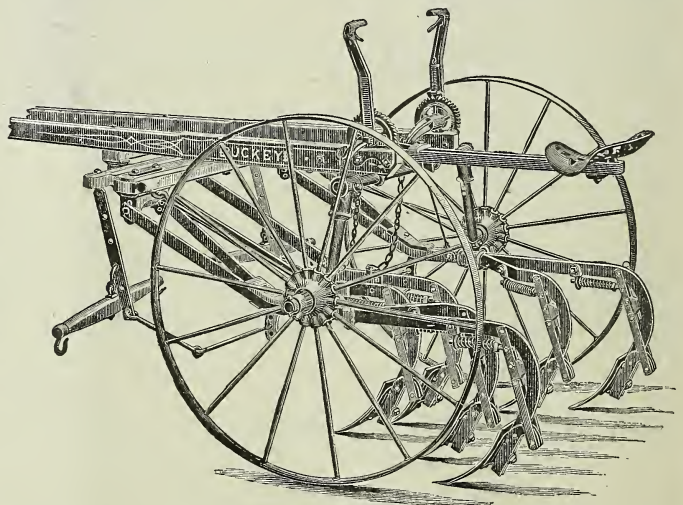
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